I hereby certify that I have reasonable basis to expect that this correspondence is being transmitted by Facsimile addressed to: Mail Stop Appeal Brief Commissioner for Patents, PO Box 1450, Alexandria VA 22313-1450 via fax number 571-273-0042 on :

February 27, 2006

Stephanie Harbin

Stephanie Harbin

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No. 10/047,878 Filed January 17, 2002
(Attorney Docket No. GP-300898)

Shigian Zhou et al. Group 2834

CENTRIFUGAL LIQUID COOLING SYSTEM FOR AN ELECTRIC MOTOR Examiner: Hanh N. Nguyen

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Mail Stop Appeal Brief-Patents
Commissioner for Patents
PO Box 1450
Alexandria VA 22313-1450

Sir:

BRIEF FOR APPELLANT GENERAL MOTORS

General Motors is filing this Brief to support the Appeal of Claims 1-12, and 14-18 which the Office Action dated November 30, 2004, finally rejected. Please charge the fee required by this Brief and any other fees as well as any extension fees, which may be due to Deposit Account No. 07-0960.

I. REAL PARTY IN INTEREST

In this appeal the real party of interest is the assignee, General Motors Corporation.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals and interferences.

III. STATUS OF CLAIMS

Claims 1-12, and 14-18 are under final rejection and are on appeal.

IV. STATUS OF AMENDMENTS

General Motors has filed no amendments since the Advisory Action of March 14, 2005.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Below is a Brief Summary discussing the objective features and advantages of the invention. Following the Brief Summary is a detailed summary complying with 37 C.F.R. 1.192(c)(3).

A. BRIEF SUMMARY

The present invention is a method and apparatus for cooling an electrical motor using a centrifugal flow of coolant such as oil. The electric motor of the present invention includes a hollow shaft having a conically-shaped hollow interior, a first set of passageways through the rotor, and a second set of passageways between the rotor and the hollow shaft. As the rotor and hollow shaft rotate, cooling fluid is forced by centrifugal force through the hollow shaft and the first and second set of passageways. The conical shape of the hollow interior of the rotating shaft creates centrifugal force that moves the cooling fluid through the hollow shaft. The openings in the rotor are at an angle with the rotor axis. The combination of this angle and the rotating motion of the rotor creates a centrifugal forces that moves the coolant in the passages.

B. DETAILED SUMMARY

Claim 1 recites an electric motor comprising a stator for producing a magnetic field a rotor rotated by said magnetic field, as described on page 3, lines 25-29 and seen in Figure 1 as elements 10, 12, and 14; a motor shaft coupled to said rotor, as described on page 4, lines 8-10 and seen in Figures 1 and 2 as element 18; a first set of passageways through the rotor to conduct a nongaseous liquid coolant, as described on page 5, lines 6-15 and seen in Figure 2 as element 32; a passage in said motor shaft to conduct said nongaseous liquid coolant, as described on page 4, lines 8-16 and seen in Figure 2 as element 22 and 24; and wherein said nongaseous liquid coolant is conducted through said rotor and said motorshaft by centrifugal force generated by the rotation of said electric motor, as described on page 4 lines 10-16 and page 5, lines 6-18.

Claim 2 recites the electric motor of Claim 1 where the stator includes current carrying coils to generate said magnetic field, as described in page 3, line 25 through page 4, line 7.

Claim 3 recites the electric motor of Claim 1 where the rotor is a squirrel cage rotor, as described on page 3, line 30.

Claim 4 recites the electric motor of Claim 1 where the rotor includes permanent magnets, as described on page 4, lines1-7.

Claim 5 recites the electric motor of Claim 1 where the motor shaft includes an interior surface that is cone shaped to conduct the nongaseous liquid coolant through the interior surface to cool the electric motor, as disclosed on page 4, lines 8-28 and seen in Figure 2.

Claim 6 recites the electric motor of Claim 1 where the first set of passageways has entrance openings and exit openings, the entrance openings oriented about the motor shaft center line at a first diameter, the exit openings oriented about the motor shaft center line at a second diameter, and the first diameter being less than the second diameter, as described on page 5, lines 6-26, and seen in Figure 2 as element 32.

Claim 7 recites the electric motor of Claim 1 further including a second set of passageways between the rotor and the motor shaft, as described on page 5 lines 19-26 and seen in Figure 2 as element 38.

Claim 8 recites the electric motor of Claim 7 wherein the second set of passageways have entrance openings and exit openings, the entrance openings oriented about the motor shaft center line at a first diameter, the exit openings oriented about the motor shaft center line at a second diameter, and the first diameter being less than the second diameter, as described on page lines 19-26 and seen in Figure 2 as element 38.

Claim 9 recites an electric motor comprising: a wound stator, as described on page 3, lines 25-29 and seen in Figure 1 as element 12, the wound stator conducting current to generate a magnetic field; a rotor rotated by the magnetic field as described on page 3, lines 25-29 and seen in Figure 1 as element 12; a motor shaft coupled to the rotor as described on page 4, lines 8-10 and seen in Figures 1 and 2 as element 18, the motor shaft including a cone shaped interior surface having an entrance opening and an exit opening, as described in page 6, lines 19-26 and seen in Figure 2, as element 38; and a nongaseous liquid coolant propelled by centrifugal force generated by the rotation of said rotor through the cone shaped interior surface, as described in page 2, lines 16-27, the nongaseous liquid coolant cooling the electric motor; and a first set of passageways through the rotor to conduct the nongaseous liquid coolant through the rotor the nongaseous liquid coolant propelled by centrifugal force through the first set of passageways, as described on page 5, lines 6-26, and seen in Figure 2 as elements 32 .

Claim 10 recites the electric motor of claim 9 where the rotor is a squirrel cage rotor, as described on page 3, line 30.

Claim 11 recites the electric motor of Claim 9, where the rotor includes permanent magnets, as described on page 4, lines1-7.

Claim 12 recites the electric motor of Claim 9 where the liquid coolant is oil, as described on page 2, line 17.

Claim 14 recites the electric motor of Claim 9 where the first set of passageways have entrance openings and exit openings, the entrance openings oriented about the motor shaft center line at a first diameter, the exit openings oriented about the motor shaft center line at a second diameter, and the first diameter being less than the second diameter, as described on page 5, lines 6-26, and seen in Figure 2 as element 32.

Claim 15 recites the electric motor of Claim 9 further including a second set of passageways between the rotor and the motor shaft, as described on page 5 lines 19-26 and seen in Figure 2 as element 38.

Claim 16 recites the electric motor of Claim 15 wherein the second set of passageways have entrance openings and exit openings, the entrance openings oriented about the motor shaft center line at a first diameter, the exit openings oriented about the motor shaft center line at a second diameter, and the first diameter being less than the second diameter, as described on page 5 lines 19-26 and seen in Figure 2 as element 38.

Claim 17 recites a method of cooling an electric motor comprising: providing an electric motor having a stator, as described on page 3, lines 25-29 and seen in Figure 1 as element 12; a rotor magnetically coupled to the stator having passageways as described on page 5, lines 6-26, and seen in Figure 2 as element 32, and a hollow motor shaft coupled to the rotor as described on page 4, lines 8-16 and seen in Figure 2 as element 22 and 24; rotating the rotor and the motor shaft; and generating a centrifugal force to force a nongaseous liquid coolant through passageways in the rotor and the hollow motor shaft, as described on page4 , line 8 through page 5, line 26 and seen in Figures 1 and 2.

Claim 18 recites the method of Claim 18 where the liquid coolant is oil, as described on page 2, line 17.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1, 2, and 6 stand rejected under 35 U.S.C. 102(a), as being anticipated by .S. Patent No. 5,019,733 to Kano et al. Claim 3 stands rejected under 35 U.S.C. 103 as being unpatentable over U.S. Patent No. 5,019,733 to Kano et al. in view of U.S. Patent No. 5,189,325 to Jarczynski. Claim 4 stands rejected under 35 U.S.C. 103 as being unpatentable over U.S. Patent No. 5,019,733 to Kano et al. Claim 5 stands rejected under 35 U.S.C. 103 as being unpatentable over U.S. Patent No. 5,019,733 to Kano et al. in view of JP 09-154258 to Yamamoto. Claims 7 and 8 stand rejected under 35 U.S.C. 103 as being unpatentable over U.S. Patent No. 5,019,733 to Kano et al. in view of U.S. Patent No. 5,994,804 to Grennan et al. Claims 9-12, 14, 17, and 18 stand rejected under 35 U.S.C. 103 as being unpatentable over JP 09-154258 to Yamamoto in view of U.S. Patent No. 5,019,733 to Kano et al. Claims 15 and 16 stand rejected under 35 U.S.C. 103 as being unpatentable over JP 09-154258 to Yamamoto in view of U.S. Patent No. 5,019,733 to Kano et al and U.S. Patent No. 5,994,804 to Grennan et al.

VII. ARGUMENT

With reference to Claims 1, 2, and 6, Kano et al. propels fluid through a shaft of an electric motor using a pump as disclosed in column 3, lines 50-52 ("This lubricating oil chamber 98 is connected with an engine oil supply source, such as a pump"). The present claimed invention utilizes centrifugal force generated by the rotation of the electric motor to propel the coolant through the rotor and motor shaft. The use of a"pumped" coolant in Kano et al. requires a coolant pump and is fundamentally different than the use of centrifugal force in the present invention. In the Advisory Action dated March 14, 2005, the Examiner stated that in column 1, lines 53-56 of Kano et al. a cooling medium consisting of air is drawn through the inlet ports toward the field coil. The present claimed invention utilizes a nongaseous liquid coolant propelled by centrifugal force, the air described in Kano et al in column 1, lines 53-56 is clearly a gas and not a nongaseous liquid. Kano et al. does not teach or suggest the present claimed invention.

With reference to Claim 4, Applicants reject the Official Notice regarding the use of a permanent magnet in and electric motor and again requests support for the Examiner's assertion.

With reference to Claim 5, Kano et al. and Yamamoto. both disclose externally pumped coolants and not the use of centrifugal force to propel liquid coolant through a rotor and motor shaft ("supplied with pressure from an external oil source" is disclosed in the abstract of Yamamoto). Kano et al. and Yamamoto, singly or in combination, do not teach or suggest the present invention.

With reference to Claim 3, Kano et al and Jarczynski both disclose externally pumped coolants and not the use of centrifugal force to propel coolant through a rotor and motor shaft. See Jarczysnki column5, lines 29-34 "the externally pumped coolant system." Kano et al. and Jarczynski, singly or in combination, do not teach or suggest the present invention

With reference to Claims 9-12, 14 ,17, and 18, Kano et al. and Yamamoto disclose externally pumped coolants and not the use of centrifugal force to propel coolant through a rotor and motor shaft. Kano et al. and Yamamoto, singly or in combination, do not teach or suggest the present invention.

With reference to Claims 15 and 16, Grennan discloses an air cooled dynamometer, as disclosed in column 2, lines 29-50. The vanes in Grennan et al. act as impellers to propel the air, as disclosed in column 5, lines 7-15. Grennan is completely silent with respect to a nongaseous liquid coolant propelled by centrifugal force through a rotor and motor shaft. Kano et al. discloses an externally pumped coolant and not the use of centrifugal force to propel nongaseous liquid coolant through a rotor and motor shaft. Furthermore, the combination of Grennan, Kano et al. and Yamamoto would generate a nonfunctioning systems, as the vanes of Grennan do not have the capability to pressurize oil in an electric motor. The CCPA and Federal Circuit have consistently held that an obviousness rejection based on a modification that destroys, the intent, purpose or function of the invention disclosed in a reference is not proper and a prima facia case of obviousness cannot be properly made. *In re Gordon* 733 F.2d 900, 221.

The Examiner has failed to explain how and why the claimed subject matter is rendered unpatentable over the prior art and point out where each of the specific limitations recited in the rejected claims is found in the prior art relied on. Specifically, the prior art does not teach or

suggest a nongaseous liquid coolant propelled by centrifugal force through a rotor and motor shaft. If the Examiner relies on personal knowledge that the apparatus of the present invention is obvious, Applicants respectfully request support for this assertion in the form of an affidavit that shall be subject to contradiction or explanation by the affidavits of the Applicants and other persons under 37 CFR 1.104(d)(2).

SUMMARY

The cited art, singly or in combination, does not teach or suggest the present claimed invention. Furthermore, the combinations suggested by the Examiner are improper. The Examiner has failed to explain how and why the claimed subject matter is rendered unpatentable over the prior art and point out where each of the specific limitations recited in the rejected claims is found in the prior art relied on. Applicants therefore request allowance of independent Claims 1-12 and 14-18.

Respectfully submitted,

Christopher DeVries - Attorney
Reg. No. 44,654
Telephone: 313-665-4969

Appendix A

1. (previously presented) An electric motor comprising:

a stator for producing a magnetic field;

a rotor rotated by said magnetic field;

a motor shaft coupled to said rotor;

a first set of passageways through said rotor to conduct a nongaseous liquid coolant

a passage in said motor shaft to conduct said nongaseous liquid coolant; and

wherein said nongaseous liquid coolant is conducted through said rotor and said motorshaft by centrifugal force generated by the rotation of said electric motor.

2. (original) The electric motor of Claim 1 wherein said stator includes current carrying coils to generate said magnetic field.

3. (original) The electric motor of Claim 1 wherein said rotor is a squirrel cage rotor.

4. (original) The electric motor of Claim 1 wherein said rotor includes permanent magnets.

5. (previously presented) The electric motor of Claim 1 wherein said motor shaft includes an interior surface that is cone shaped to conduct said nongaseous liquid coolant through said interior surface to cool the electric motor.

6. (previously presented) The electric motor of Claim 1 wherein said first set of passageways has entrance openings and exit openings, said entrance openings oriented about said motor shaft center line at a first diameter, said exit openings oriented about said motor shaft center line at a second diameter, and said first diameter being less than said second diameter.

7. (original) The electric motor of Claim 1 further including a second set of passageways between said rotor and said motor shaft.

8. (original) The electric motor of Claim 7 wherein said second set of passageways have entrance openings and exit openings, said entrance openings oriented about said motor shaft center line at a first diameter, said exit openings oriented about said motor shaft center line at a second diameter, and said first diameter being less than said second diameter.

9. (previously presented) An electric motor comprising:

a wound stator, said wound stator conducting current to generate a magnetic field;

a rotor rotated by said magnetic field;

a motor shaft coupled to said rotor, said motor shaft including a cone shaped interior surface having an entrance opening and an exit opening; and

a nongaseous liquid coolant propelled by centrifugal force generated by the rotation of said rotor through said cone shaped interior surface, said nongaseous liquid coolant cooling the electric motor; and

a first set of passageways through said rotor to conduct said nongaseous liquid coolant through said rotor said nongaseous liquid coolant propelled by centrifugal force through said first set of passageways .

10. (original) The electric motor of claim 9 wherein said rotor is a squirrel cage rotor.

11. (original) The electric motor of Claim 9, wherein said rotor includes permanent magnets.

12. (original) The electric motor of Claim 9 wherein said liquid coolant is oil.

13. cancelled.

14. (previously presented) The electric motor of Claim 9 wherein said first set of passageways have entrance openings and exit openings, said entrance openings oriented about said motor shaft center line at a first diameter, said exit openings oriented about said motor shaft center line at a second diameter, and said first diameter being less than said second diameter.

15. (original) The electric motor of Claim 9 further including a second set of passageways between said rotor and said motor shaft.

16. (original) The electric motor of Claim 15 wherein said second set of passageways have entrance openings and exit openings, said entrance openings oriented about said motor shaft center line at a first diameter, said exit openings oriented about said motor shaft center line at a second diameter, and said first diameter being less than said second diameter.

17. (currently amended) A method of cooling an electric motor comprising:

providing an electric motor having a stator, a rotor magnetically coupled to said stator having passageways, and a hollow motor shaft coupled to said rotor;

rotating said rotor and said motor shaft; and

generating a centrifugal force to force a nongaseous liquid coolant through passageways in said rotor and said hollow motor shaft.

18. (Original) The method of Claim 18 wherein said liquid coolant is oil.

Evidence Appendix

There is no evidence entered and relied upon in this appeal

Related Proceedings Appendix

There are no proceedings related to this appeal.